

**Patent claims**

1. A process for producing an  $\text{Si}_3\text{N}_4$ -coated  $\text{SiO}_2$  shaped body from an  $\text{SiO}_2$  green body, wherein a precursor which is suitable for forming an  $\text{Si}_3\text{N}_4$  sintered layer is applied to a surface of the amorphous, open-pore  $\text{SiO}_2$  green body, and then the precursor is converted in situ into an  $\text{Si}_3\text{N}_4$  sintered layer under a laser beam.
2. The process as claimed in claim 1, wherein the laser beam is the beam from a  $\text{CO}_2$  laser.
3. The process as claimed in claim 1 or 2, wherein the  $\text{SiO}_2$  shaped body is a solar crucible, and the precursor is applied on one side, to the inner-side surface of the  $\text{SiO}_2$  green body.
4. The process as claimed in one of claims 1 to 3, wherein the precursor which is suitable for forming an  $\text{Si}_3\text{N}_4$  sintered layer is selected from the group consisting of  $\text{Si}_3\text{N}_4$  powder, silicon powder, silicon oxide/carbon mixtures and polysilazanes.
5. The process as claimed in claim 4, wherein the precursor is an  $\text{Si}_3\text{N}_4$  powder.
6. The process as claimed in claim 5, wherein the  $\text{Si}_3\text{N}_4$  powder has a grain size of between 100 nm and 100  $\mu\text{m}$ , preferably between 100 nm and 50  $\mu\text{m}$  and particularly preferably between 100 nm and 10  $\mu\text{m}$ .
7. The process as claimed in claim 5 or 6, wherein the  $\text{Si}_3\text{N}_4$  powder is applied in the form of an  $\text{Si}_3\text{N}_4$  powder dispersion by spraying the surface of the  $\text{SiO}_2$  green body, and is then

dried.

8. The process as claimed in claim 7, wherein the dispersion comprises a dispersant selected from the group consisting of alcohols, acetone and water.
9. The process as claimed in one or more of claims 6 to 8, wherein the  $\text{Si}_3\text{N}_4$  powder layer which is present on the surface has a layer thickness of from 1 to 1000  $\mu\text{m}$ , preferably from 1 to 500  $\mu\text{m}$ .
10. The process as claimed in one or more of claims 1 to 9, wherein the  $\text{SiO}_2$  green body, after the precursor has been applied, is irradiated by a laser beam with a focal spot diameter of at least 2 cm.
11. The process as claimed in one or more of claims 1 to 10, wherein the laser beam has a radiation power density of from 50 W to 500 W per square centimeter, particularly preferably from 100 to 200 and very particularly preferably from 130 to 180  $\text{W}/\text{cm}^2$ .
12. The process as claimed in one or more of claims 1 to 11, wherein the formation of the  $\text{Si}_3\text{N}_4$  sintered layer takes place at a temperature of between 1000°C and 1600°C, particularly preferably between 1100°C and 1200°C.
13. The process as claimed in one or more of claims 1 to 12, wherein the irradiation is carried out uniformly and continuously.